

## Appendix 1

### Emission Calculations and Vendor Supplied Equipment Information

**Particulate Matter Emissions Analysis**  
**Powder Handling Operations**  
**Idaho Milk Products**

	<b>Output</b> (lb/hr)
<b><u>MPC/Skim Dryer</u></b>	
P101A Dryer Baghouse 1 (to ambient)	3.80
P101B Dryer Baghouse 2 (to ambient)	3.80
<b><u>MPC/Skim Fluid-Bed</u></b>	
P102 Fluid Bed Baghouse (to ambient)	0.78
<b><u>Permeate Dryer</u></b>	
P103 Permeate Dryer Scrubber (to ambient)	6.92
<b><u>Permeate Fluid-Bed</u></b>	
P104 Permeate Fluid-Bed Baghouse (to ambient)	1.97
<b><u>Permeate Powder Receiver</u></b>	
P105 Permeate Powder Receiver Baghouse (to ambient)	0.047
<b>Total (to ambient):</b>	<b>17.31</b>

**Process Weight Rule (IDAPA 58.01.01.700)**

$$E = 1.10 \times PW^{0.25}$$

**Maximum**

PW (raw milk/day) = 3,000,000

PW (raw milk/hr) = 125,000

E (lb PM/hr) = **20.68**



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November 5, 2007

Mr. Troy D. Riecke, P.E.  
 Millennium Science & Engineering, Inc.  
 1605 N. 13<sup>th</sup> Street  
 Boise, Idaho 83702

RE: DEQ Letter 11/02/2007

Dear Troy:

In response to the copy of the DEQ letter referenced above we offer the following responses;

**1. Documentation or limitation supporting the maximum specified production capacity of 3.0 million pounds of raw milk per day**

The maximum design capacity of the equipment is as listed. Each piece of equipment can handle only that which is guaranteed.

**2. Verification of the control device efficiencies and associated emission calculations**

Efficiencies listed on process flow diagrams are emissions guaranteed by manufacturer. C.E. Rogers cannot provide calculations to verify the design as these are considered proprietary. Actual efficiencies are expected to be higher, and in previous installations are higher.

Dryer Control Device

MPC Dryer

Quantity	Control Device	Mfg.	Model No.	Type	Design Data
2	Baghouses	CER	CER-400	Reverse Air	400-6" dia. x 16' lg. collector bags (AC=7/1)
4	Cyclones	CER	CER-94		97.0% Eff.
1	FB Baghouse	CER	CER-78	Reverse Air	96-6" dia. x 12' lg. collector bags (AC=5/1)

Permeate Dryer

Quantity	Control Device	Mfg.	Model No.	Type	Design Data
1	Scrubber	CER	CER-WSS 11' dia.	Water Circulating Scrubber System	250 GPM Internal Scrubber Spray
2	Cyclones	CER	CER-104		98.5% Eff.
1	FB Baghouse	CER	CER-216	Reverse Air	216-6" dia. x 14' lg. collector bags (AC=6.5/1)



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1	Powder Receiver Baghouse	Nu-Con	NCRD 84-21-3T	Reverse Air	84-collector bags (AC=4.7/1)
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**3. Documentation supporting the stack parameters provided for each emission point source at the point of release, including intermediate calculations where parameters are estimated. Typical parameters should be used in the modeling analyses rather than maximums or minimums, and where values are uncertain, a conservative estimate should be used.**

Stack parameters: Air supply and discharge temperatures are chosen using past experience. Air flows are then calculated knowing the equipment capacity and using air temperatures chosen by the designer. The air flows are calculated by using propriety air flow calculations. Fans, ducts, control devices are then sized knowing the required air flow for the process capacity.

Stack emissions are all vertical discharges uninterrupted while the equipment is in operation with the exception of the permeate dryer powder receiver baghouse which is horizontal.

The airflows and temperatures listed are expected averages.

**4. Additional documentation for the control device equipment**

The baghouses will use differential pressure transmitters and broken bag detectors to monitor performance.

Required baghouse maintenance involves cleaning of the baghouse at least 1 time per year, and replacement of broken bags. Complete bag replacement should be done at the time of cleaning.

The scrubber system incorporates a density meter to monitor the solids levels in the circulating water as well as a differential pressure transmitter to monitor pressure drop across the unit. The scrubber system will be cleaned on the same interval as the dryer wet side.

Maxon Burner Statement

Please refer to letter of November 5, 2007 from Maxon Corp. to Justin Schley of CER.

Respectfully submitted,

C.E. Rogers Company

Howard J. Rogers, President

/hjr

November 5, 2007

C. E Rogers Company

Attn: Mr. Justin Schley

SUBJECT: Maxon Crossfire Burner Emissions

Dear Mr. Schley:

Expected emissions for the Crossfire Burner are 30ppm Nox(corrected to 3% O2) & 400ppm CO (corrected to 3% O2)

Application variables that effect Nox & CO emissions are process cross velocities, moisture and operating temperatures.

Please feel free to call with any questions.

Sincerely,

Larry Hyland

Manager-Technical Sales Support

## Capacities and Operating Data

### Performance Data

Lineal heat release at high fire	Btu/hr/ft	1,000,000	1,250,000	1,500,000	1,750,000	2,000,000	2,250,000	2,500,000
Minimum lineal heat release	Btu/hr/ft	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Turndown ratio		10:1	12.5:1	15:1	17.5:1	20:1	22.5:1	25:1
Flame length	feet [1]	2.7	3.2	3.6	4.0	4.3	4.7	5.0
Pilot pressure/heat release	"w.c.* [2] / Btu/hr	5-8" w.c. / 40,000 Btu/hr						
Combustion air flow	SCFM	250	313	375	438	500	563	625
Air pressure at burner inlet	("w.c.") [3]	2.3	3.6	5.1	7.0	9.1	11.5	14.2
Air pressure at burner test connection	("w.c.")*	2.1	3.3	4.7	6.4	8.3	10.5	13.0
Fuel pressure at burner inlet (natural gas)	("w.c.") [3]	8.5	13.3	19.2	26.1	34.1	43.2	53.3
Fuel pressure at burner test connection (natural gas)	("w.c.")*	7.4	11.5	16.6	22.5	29.4	37.3	46.0
NOx emissions [4]	ppm @ 3% O <sub>2</sub>	<25 ppm corrected to 3% O <sub>2</sub> dry						
CO emissions [4]	ppm @ 3% O <sub>2</sub>	<250 ppm corrected to 3% O <sub>2</sub> dry						

[1] Flame length is based on 50% excess combustion air. Flame length will vary depending on various application parameters (e.g. passing air stream velocity, oxygen content, and combustion air preheat temperature)

[2] At inlet of adjustable pilot orifice.

[3] Air and gas DP is differential over system static pressure.

[4] Emissions stated are not guaranteed. Actual emission performance may vary. Contact Maxon for specific application details.

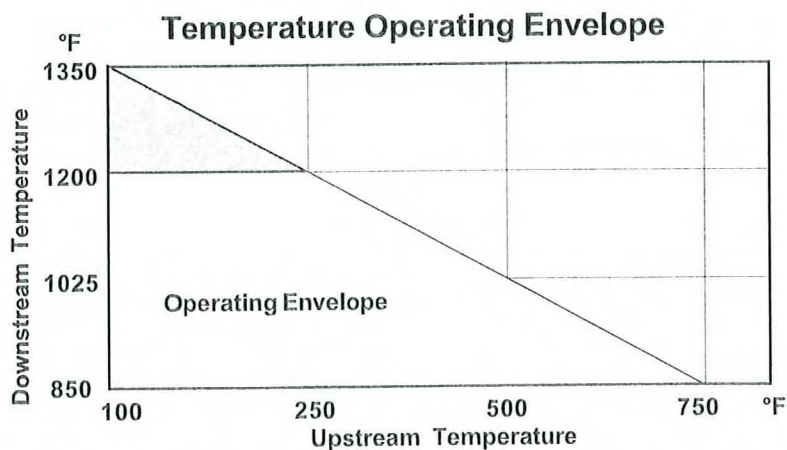
\*Differential pressures measured at burner test connections. Air and gas DP is differential over system static pressure.

### Operating Environment

Variable		Minimum	Maximum
Inlet Combustion Air Temp.	°F	Ambient	400
Inlet Combustion Air O <sub>2</sub> Level	% O <sub>2</sub>	20.8	20.8
Air Stream Cross Velocity	ft/min	0	3000
Air Stream Axial Velocity	ft/min	0	4000
Upstream Air Temperature	°F	See Chart Below	
Downstream Air Temperature	°F		
Process Air Stream O <sub>2</sub> Level	% O <sub>2</sub>	4	21

The burner can operate in a variety of environments. Typical operating environments, limits on their variables, and notes concerning operation of the burner are presented at left.

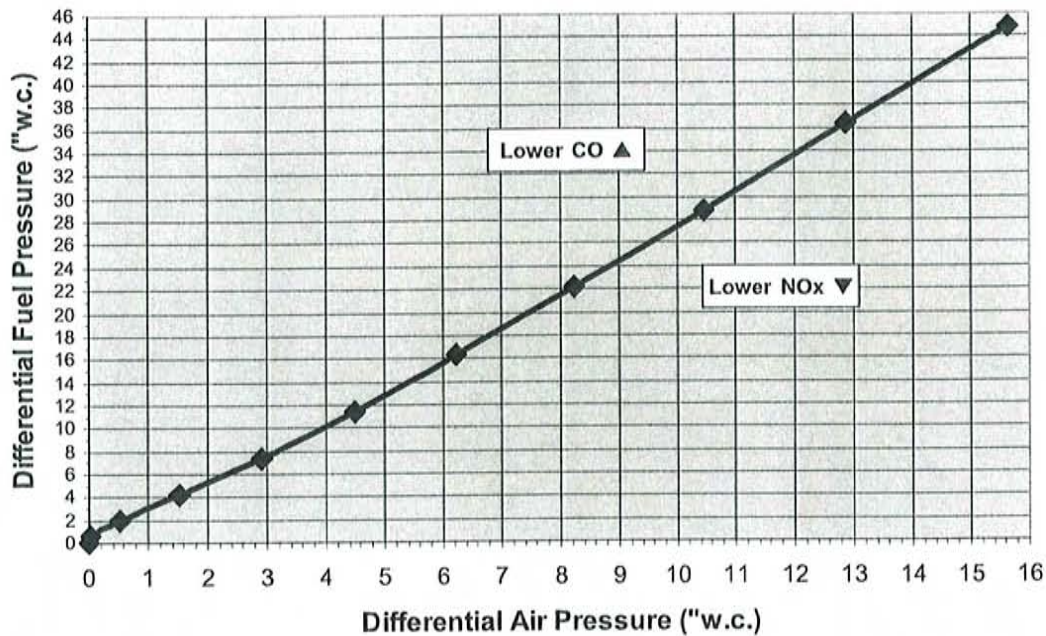
It is important to note that inlet combustion variables such as O<sub>2</sub> level and combustion air temperature will change air pressure requirements and/or maximum firing capacity.



Consult Maxon for operation in shaded region. Ability to operate in shaded region is dependent upon operating conditions.

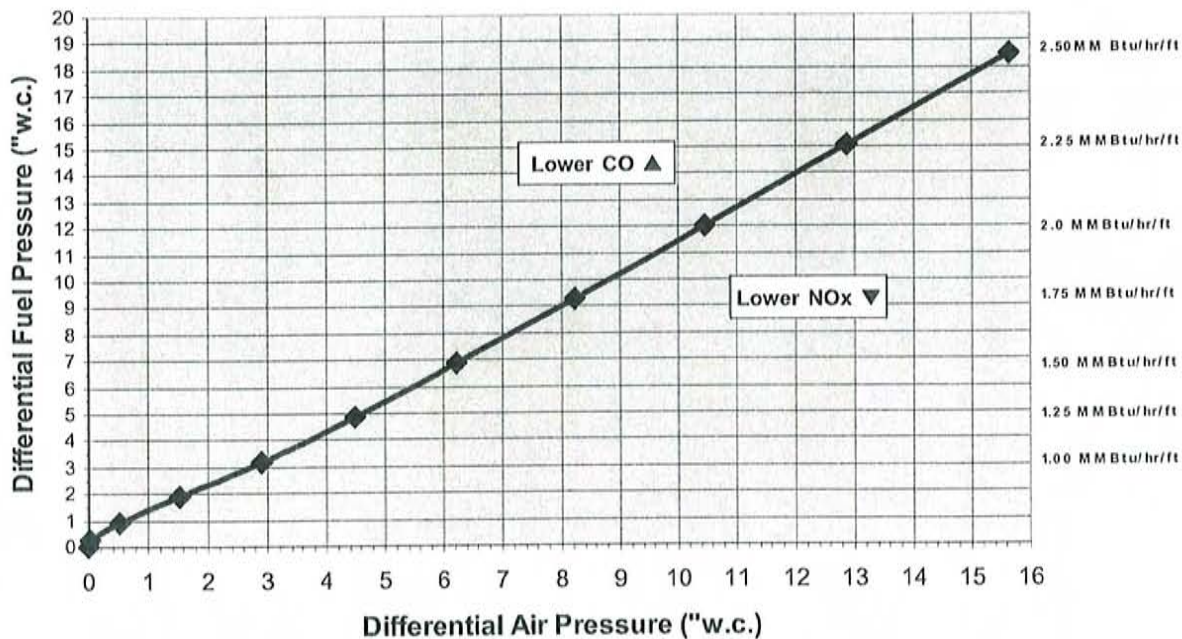
## Capacities and Operating Data

### Natural Gas Fuel/Air Settings



NOTE: Pressure measured at burner test connections; refer to inlet pressure requirements for fan sizing

### Propane Fuel/Air Settings



NOTE: Pressure measured at burner test connections; refer to inlet pressure requirements for fan sizing

**Emission Factor Calculation: MPC/Skim Dryer (P101)**  
**Idaho Milk Products, Inc.**

	Variable	NOx	CO	Notes
Concentration (ppb)	C <sub>1</sub>	30,000	400,000	(source: @ 3% O <sub>2</sub> , guarantee from Maxon Corporation)
Temperature (°F)	T <sub>a</sub>	390	390	(source: C/E/Rogers - Process Flow Diagram)
Temperature (K)	T <sub>a</sub>	472.04	472.04	(source: unit conversion)
Atmospheric Pressure (hPa)	P <sub>a</sub>	885.49	885.49	(source: site specific value)
Molecular Weight (g/mole)	MW	46.00	28.00	
Concentration (ug/ft <sup>3</sup> )	C <sub>2</sub>	882.7	7,163.6	(source: calculation C <sub>2</sub> = C <sub>1</sub> x MW x 298 K x P <sub>a</sub> / (24.45 l/mole x T <sub>a</sub> x 1013 hPa) / 35.29 ft <sup>3</sup> /m <sup>3</sup> )
Flow Rate (scfm/ft of heater)	Q	500	500	(source: Maxon specification sheet)
Max Heat Release (MMBTU/hr/ft)	H	2.00	2.00	(source: Maxon specification sheet)
Emission Factor (lb/MMBTU)	EF	0.029	0.237	(source: calculation EF = C <sub>2</sub> x Q x 60 min/hr / (453.6 g/lb x H x 1E+6 ug/g)
Emission Factor (lb/MMBTU) adjustment for 3% O <sub>2</sub>		<b>0.034</b>	<b>0.28</b>	(source: calculation = EF x 21% / (21% - 3%))

**Emission Factor Calculation: Permeate Dryer (P103)**  
**Idaho Milk Products, Inc.**

	Variable	NOx	CO	Notes
Concentration (ppb)	C <sub>1</sub>	30,000	400,000	(source: @ 3% O <sub>2</sub> , guarantee from Maxon Corporation)
Temperature (°F)	T <sub>a</sub>	290	290	(source: C/E/Rogers - Process Flow Diagram)
Temperature (K)	T <sub>a</sub>	416.48	416.48	(source: unit conversion)
Atmospheric Pressure (hPa)	P <sub>a</sub>	885.49	885.49	(source: site specific value)
Molecular Weight (g/mole)	MW	46.00	28.00	
Concentration (ug/ft <sup>3</sup> )	C <sub>2</sub>	1,000.4	8,119.2	(source: calculation $C_2 = C_1 \times MW \times 298 \text{ K} \times P_a / (24.45 \text{ l/mole} \times T_a \times 1013 \text{ hPa}) / 35.29 \text{ ft}^3/\text{m}^3$ )
Flow Rate (scfm/ft of heater)	Q	500	500	(source: Maxon specification sheet)
Max Heat Release (MMBTU/hr/ft)	H	2.00	2.00	(source: Maxon specification sheet)
Emission Factor (lb/MMBTU)	EF	0.033	0.268	(source: calculation $EF = C_2 \times Q \times 60 \text{ min/hr} / (453.6 \text{ g/lb} \times H \times 1\text{E}+6 \text{ ug/g})$ )
Emission Factor (lb/MMBTU) adjustment for 3% O <sub>2</sub>		<b>0.039</b>	<b>0.31</b>	(source: calculation = $EF \times 21\% / (21\% - 3\%)$ )

# Criteria Air Pollutant Emissions MPC/Skim Milk Dryer (P101)

Combustion Source Characteristics		Stack Data <sup>d, g</sup>		
Dryer Manufacturer	Maxon	Stack ID	P101A	P101B
Burner Model	Crossfire Line Burner	Stack Height (ft)	135.75	135.75
Input Heat Capacity (BTU/hr) <sup>f</sup>	40,000,000	Stack Diameter (ft)	5.75	5.75
Fuel	Natural Gas	Exit Gas Temperature (°F)	190	190
Heating Value (BTU/scf)	1,020	Wet Actual Flow Rate (acfm)	63,500	63,500
Max Hourly Fuel Consumption (scf/hr) <sup>f</sup>	39,216	Stack Velocity (m/s)	12.42	12.42
Annual Fuel Consumption (scf/yr) <sup>f</sup>	343,529,412	Fd (dscf stack gas/BTU)	0.00871	
Site Information		Grain Loading Flow Rate (dscfm)	7,756	
Jerome Barometric Pressure (mm Hg)	664.34			

Criteria Pollutants						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM <sub>10</sub>	NG Combustion + Process	See Note b		7.896	34.6	0.99
SO <sub>2</sub>	NG Combustion	0.6	lb/10 <sup>6</sup> scf	0.024	0.1	0.0030
NO <sub>x</sub>	NG Combustion	0.039	lb/10 <sup>6</sup> BTU	1.560	6.8	0.197
CO	NG Combustion	0.31	lb/10 <sup>6</sup> BTU	12.400	54.3	1.562
VOC	NG Combustion	5.5	lb/10 <sup>6</sup> scf	0.216	0.9	0.027
Lead	NG Combustion	0.0005	lb/10 <sup>6</sup> scf	1.96E-05	0.0	2.47E-06

Non-Criteria Pollutants with Significant Threshold						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM	NG Combustion + Process	See PM <sub>10</sub>		7.896	34.6	0.99
Beryllium	NG Combustion	<1.2E-5	lb/10 <sup>6</sup> scf	4.71E-07	0.0	5.93E-08
Mercury	NG Combustion	2.60E-04	lb/10 <sup>6</sup> scf	1.02E-05	0.0	1.28E-06

PM Grain Loading Standard <sup>c</sup>					
Pollutant	Pollutant Source	Potential Emissions (lb/hr)	Grain Load @ 3% Oxygen (gr/dscf)	PM Grain Standard <sup>c</sup> (gr/dscf)	Meets Standard?
PM	NG Combustion	0.298	0.004	0.015	yes

## Notes:

(a) The emission factor for PM/PM<sub>10</sub> estimated from vendor supplied information and from natural gas fuel combustion emission factors AP-42 Chapter 1.4, "Natural Gas Combustion" (see note b below). NO<sub>x</sub> and CO emission factors were estimated based on manufacturer guarantee of 30 ppm NO<sub>x</sub> and 400 ppm CO (both at 3% O<sub>2</sub>). Emission factors were calculated for both dryers (see emission factor guarantee sheets) the highest of the two emission factors calculated for each pollutant was used for both dryers to be conservative. The remaining pollutant emissions were estimated using AP-42 emission factors for natural gas combustion (Chapter 1.4).

(b) PM<sub>10</sub> emissions estimated based on the following: PM<sub>10</sub> = (7.6 lb/10<sup>6</sup> scf fuel x 39,216 scf fuel/hr) + 7.6 lb/hr = 7.896 lb/hr  
AP-42 Chapter 1.4, "Natural Gas Combustion" C/E/Rogers Process Guarantee

(c) IDAPA 58.01.01.677, computed for fuel combusting equipment only, excludes particulate emissions associated with the milk drying process.

(d) Prior to discharge to the atmosphere at each stack emissions are routed through two cyclones and a baghouse before final discharge. Listed emissions rates are combined emissions that are emitted through both stacks. For modeling purposes emissions were modeled with one stack not emitting (i.e. P101A emitting full emission rate while P101B not emitting and vice versa) for PM<sub>10</sub> but all other pollutants were modeled at the full rate through each stack.

(e) The emission rates for NO<sub>x</sub> and CO were reduced for the dryers after completing modeling at a higher rate. The listed rates are correct and are used for calculation of the emissions inventory for the facility but the original modeling was not rerun since it was conservative and demonstrated compliance.

(f) Heat input capacity from Maxon spec sheet (20 ft of lineal burner @ 2 MMBTU/ft), this is the maximum rated heat input capacity. Max hourly fuel consumption calculated by dividing the heat input capacity by the fuel heating value. Annual fuel consumption assumes max firing throughout the year.

(g) Stack parameters were determined as follows: discharge temperature = actual (based on design by C/E/Rogers), discharge flow rate = actual (based on design by C/E/Rogers), stack height and diameter = actual (details provided on construction drawings).

# Toxic Air Pollutant Emissions MPC/Skim Milk Dryer (P101)

## Combustion Source Characteristics

Boiler Manufacturer	Maxon
Burner Model	Crossfire Line Burner
Input Heat Capacity (BTU/hr)	40,000,000
Fuel	Natural Gas
Heating Value (BTU/scf)	1,020
Max Hourly Fuel Consumption (scf/hr)	39,216
Annual Fuel Consumption (scf/yr)	343,529,412

Toxic Air Pollutants					
Pollutant	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (g/s)	Emission Limit <sup>b</sup> (lb/hr)
Arsenic	2.00E-04	lb/10 <sup>6</sup> scf	7.84E-06	9.88E-07	1.50E-06
Barium	4.40E-03	lb/10 <sup>6</sup> scf	1.73E-04	2.17E-05	3.30E-02
Benzene	2.10E-03	lb/10 <sup>6</sup> scf	8.24E-05	1.04E-05	8.00E-04
Beryllium	<1.2E-5	lb/10 <sup>6</sup> scf	4.71E-07	5.93E-08	2.80E-05
Benzo(a)pyrene	<1.2E-6	lb/10 <sup>6</sup> scf	4.71E-08	5.93E-09	2.00E-06
Bis (2-ethylhexyl)phthalate	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	2.80E-02
Cadmium	1.10E-03	lb/10 <sup>6</sup> scf	4.31E-05	5.44E-06	3.70E-06
Chromium	1.40E-03	lb/10 <sup>6</sup> scf	5.49E-05	6.92E-06	3.30E-02
Cobalt	8.40E-05	lb/10 <sup>6</sup> scf	3.29E-06	4.15E-07	3.30E-03
Copper	8.50E-04	lb/10 <sup>6</sup> scf	3.33E-05	4.20E-06	3.33E-01
Dibutylphthalate	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	6.70E-02
Dichlorobenzene	1.20E-03	lb/10 <sup>6</sup> scf	4.71E-05	5.93E-06	2.00E+01
Ethylbenzene	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	2.90E+01
Fluorene	2.80E-06	lb/10 <sup>6</sup> scf	1.10E-07	1.38E-08	1.33E-01
Formaldehyde	7.50E-02	lb/10 <sup>6</sup> scf	2.94E-03	3.71E-04	5.10E-04
Hexane	1.80E+00	lb/10 <sup>6</sup> scf	7.06E-02	8.89E-03	1.20E+01
Manganese	3.80E-04	lb/10 <sup>6</sup> scf	1.49E-05	1.88E-06	3.33E-01
Mercury	2.60E-04	lb/10 <sup>6</sup> scf	1.02E-05	1.28E-06	3.00E-03
Molybdenum	1.10E-03	lb/10 <sup>6</sup> scf	4.31E-05	5.44E-06	3.33E-01
Napthalene	6.10E-04	lb/10 <sup>6</sup> scf	2.39E-05	3.01E-06	3.33E+00
Nickel	2.10E-03	lb/10 <sup>6</sup> scf	8.24E-05	1.04E-05	2.70E-05
Pentane	2.60E+00	lb/10 <sup>6</sup> scf	1.02E-01	1.28E-02	1.18E+02
Phenol	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	1.27E+00
Selenium	<2.4E-5	lb/10 <sup>6</sup> scf	9.41E-07	1.19E-07	1.30E-02
Toluene	3.40E-03	lb/10 <sup>6</sup> scf	1.33E-04	1.68E-05	2.50E+01
Vanadium	2.30E-03	lb/10 <sup>6</sup> scf	9.02E-05	1.14E-05	3.00E-03
o-Xylene	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	2.90E+01
Zinc	2.90E-02	lb/10 <sup>6</sup> scf	1.14E-03	1.43E-04	6.67E-01

**Notes:**

(a) Emission Factors from AP-42 Chapter 1.4, "Natural Gas Combustion".

(b) IDAPA 58.01.01.585 and 586

\* FNA - Factor Not Available

# Criteria Air Pollutant Emissions MPC/Skim Milk Fluid-Bed (P102)

Combustion Source Characteristics	
Manufacturer	C/E/Rogers
Model	Fluid-Bed Baghouse

Stack Data <sup>b</sup>	
Stack ID	P102
Stack Height (ft)	135.75
Stack Diameter (ft)	2.50
Exit Gas Temperature (°F)	130
Wet Actual Flow Rate (acfm)	9,090.7
Stack Velocity (m/s)	9.40

Criteria Pollutants						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM <sub>10</sub>	Process	See Note a		0.775	3.4	0.10

Non-Criteria Pollutants with Significant Threshold						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM	Process	See PM <sub>10</sub>		0.775	3.4	0.10

**Notes:**

(a) Emission factor for PM/PM10 estimated from C/E/Rogers performance guarantee (see attached process flow diagram).

(b) Stack parameters were determined as follows: discharge temperature = actual (based on design by C/E/Rogers), discharge flow rate = actual (based on design by C/E/Rogers), stack height and diameter = actual (details provided on construction drawings).

# Criteria Air Pollutant Emissions Permeate Dryer (P103)

Combustion Source Characteristics		Stack Data <sup>f</sup>	
Dryer Manufacturer	Maxon	Stack ID	P103
Burner Model	Crossfire Line Burner	Stack Height (ft)	116.75
Input Heat Capacity (BTU/hr) <sup>e</sup>	12,000,000	Stack Diameter (ft)	6.50
Fuel	Natural Gas	Exit Gas Temperature (°F)	112
Heating Value (BTU/scf)	1,020	Wet Actual Flow Rate (acfm)	52,463
Max Hourly Fuel Consumption (scf/hr) <sup>e</sup>	11,765	Stack Velocity (m/s)	8.03
Annual Fuel Consumption (scf/yr) <sup>e</sup>	103,058,824	Fd (dscf stack gas/BTU)	0.00871
		Grain Loading Flow Rate (dscfm)	2,327
Site Information			
Jerome Barometric Pressure (mm Hg)	664.34		

Criteria Pollutants						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s) <sup>d</sup>
PM <sub>10</sub>	NG Combustion + Process	See Note b		7.006	30.7	0.88
SO <sub>2</sub>	NG Combustion	0.6	lb/10 <sup>6</sup> scf	0.007	0.0	0.0009
NO <sub>x</sub>	NG Combustion	0.039	lb/10 <sup>6</sup> BTU	0.468	2.0	0.059
CO	NG Combustion	0.31	lb/10 <sup>6</sup> BTU	3.720	16.3	0.469
VOC	NG Combustion	5.5	lb/10 <sup>6</sup> scf	0.065	0.3	0.008
Lead	NG Combustion	0.0005	lb/10 <sup>6</sup> scf	5.88E-06	0.0	7.41E-07

Non-Criteria Pollutants with Significant Threshold						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM	NG Combustion + Process	See PM <sub>10</sub>		7.006	30.7	0.88
Beryllium	NG Combustion	<1.2E-5	lb/10 <sup>6</sup> scf	1.41E-07	0.0	1.78E-08
Mercury	NG Combustion	2.60E-04	lb/10 <sup>6</sup> scf	3.06E-06	0.0	3.85E-07

PM Grain Loading Standard <sup>c</sup>					
Pollutant	Pollutant Source	Potential Emissions (lb/hr)	Grain Load @ 3% Oxygen (gr/dscf)	PM Grain Standard <sup>c</sup> (gr/dscf)	Meets Standard?
PM	NG Combustion	0.089	0.004	0.015	yes

## Notes:

(a) The emission factor for PM/PM<sub>10</sub> estimated from vendor supplied information and from natural gas fuel combustion emission factors AP-42 Chapter 1.4, "Natural Gas Combustion" (see note b below). NO<sub>x</sub> and CO emission factors were estimated based on manufacturer guarantee of 30 ppm NO<sub>x</sub> and 400 ppm CO (both at 3% O<sub>2</sub>). Emission factors were calculated for both dryers (see emission factor calculation sheets) the highest of the two emission factors calculated for each pollutant was used for both dryers to be conservative. The remaining pollutant emissions were estimated using AP-42 emission factors for natural gas combustion (Chapter 1.4).

(b) PM<sub>10</sub> emissions estimated based on the following: PM<sub>10</sub> = (7.6 lb/10<sup>6</sup> scf fuel x 11,765 scf fuel/hr) + 6.92 lb/hr = 7.006 lb/hr  
AP-42 Chapter 1.4, "Natural Gas Combustion" C/E/Rogers original Process Guarantee

C/E/Rogers updated their performance guarantee for the dryer baghouse to discharge 3.4515 lb/hr. This change is not reflected in this calculation sheet, the emissions inventory, or in modeling since we were able to demonstrate compliance using the higher limit.

(c) IDAPA 58.01.01.677, computed for fuel combusting equipment only, excludes particulate emissions associated with the milk drying process.

(d) The emission rates for NO<sub>x</sub> and CO were reduced for the dryers after completing modeling at a higher rate. The listed rates are correct and are used for calculation of the emissions inventory for the facility but the original modeling was not rerun since it was conservative and demonstrated compliance.

(e) Heat input capacity from Maxon spec sheet (6 ft of lineal burner @ 2 MMBTU/ft), this is the maximum rated heat input capacity. Max hourly fuel consumption calculated by dividing the heat input capacity by the fuel heating value. Annual fuel consumption assumes max firing throughout the year.

(f) Stack parameters were determined as follows: discharge temperature = actual (based on design by C/E/Rogers), discharge flow rate = actual (based on design by C/E/Rogers), stack height and diameter = actual (details provided on construction drawings).

# Toxic Air Pollutant Emissions Permeate Dryer (P103)

## Combustion Source Characteristics

Boiler Manufacturer	Maxon
Burner Model	Crossfire Line Burner
Input Heat Capacity (BTU/hr)	12,000,000
Fuel	Natural Gas
Heating Value (BTU/scf)	1,020
Max Hourly Fuel Consumption (scf/hr)	11,765
Annual Fuel Consumption (scf/yr)	103,058,824

Toxic Air Pollutants					
Pollutant	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (g/s)	Emission Limit <sup>b</sup> (lb/hr)
Arsenic	2.00E-04	lb/10 <sup>6</sup> scf	2.35E-06	2.96E-07	1.50E-06
Barium	4.40E-03	lb/10 <sup>6</sup> scf	5.18E-05	6.52E-06	3.30E-02
Benzene	2.10E-03	lb/10 <sup>6</sup> scf	2.47E-05	3.11E-06	8.00E-04
Beryllium	<1.2E-5	lb/10 <sup>6</sup> scf	1.41E-07	1.78E-08	2.80E-05
Benzo(a)pyrene	<1.2E-6	lb/10 <sup>6</sup> scf	1.41E-08	1.78E-09	2.00E-06
Bis (2-ethylhexyl)phthalate	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	2.80E-02
Cadmium	1.10E-03	lb/10 <sup>6</sup> scf	1.29E-05	1.63E-06	3.70E-06
Chromium	1.40E-03	lb/10 <sup>6</sup> scf	1.65E-05	2.08E-06	3.30E-02
Cobalt	8.40E-05	lb/10 <sup>6</sup> scf	9.88E-07	1.25E-07	3.30E-03
Copper	8.50E-04	lb/10 <sup>6</sup> scf	1.00E-05	1.26E-06	3.33E-01
Dibutylphthalate	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	6.70E-02
Dichlorobenzene	1.20E-03	lb/10 <sup>6</sup> scf	1.41E-05	1.78E-06	2.00E+01
Ethylbenzene	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	2.90E+01
Fluorene	2.80E-06	lb/10 <sup>6</sup> scf	3.29E-08	4.15E-09	1.33E-01
Formaldehyde	7.50E-02	lb/10 <sup>6</sup> scf	8.82E-04	1.11E-04	5.10E-04
Hexane	1.80E+00	lb/10 <sup>6</sup> scf	2.12E-02	2.67E-03	1.20E+01
Manganese	3.80E-04	lb/10 <sup>6</sup> scf	4.47E-06	5.63E-07	3.33E-01
Mercury	2.60E-04	lb/10 <sup>6</sup> scf	3.06E-06	3.85E-07	3.00E-03
Molybdenum	1.10E-03	lb/10 <sup>6</sup> scf	1.29E-05	1.63E-06	3.33E-01
Napthalene	6.10E-04	lb/10 <sup>6</sup> scf	7.18E-06	9.04E-07	3.33E+00
Nickel	2.10E-03	lb/10 <sup>6</sup> scf	2.47E-05	3.11E-06	2.70E-05
Pentane	2.60E+00	lb/10 <sup>6</sup> scf	3.06E-02	3.85E-03	1.18E+02
Phenol	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	1.27E+00
Selenium	<2.4E-5	lb/10 <sup>6</sup> scf	2.82E-07	3.56E-08	1.30E-02
Toluene	3.40E-03	lb/10 <sup>6</sup> scf	4.00E-05	5.04E-06	2.50E+01
Vanadium	2.30E-03	lb/10 <sup>6</sup> scf	2.71E-05	3.41E-06	3.00E-03
o-Xylene	FNA	lb/10 <sup>6</sup> scf	FNA	FNA	2.90E+01
Zinc	2.90E-02	lb/10 <sup>6</sup> scf	3.41E-04	4.30E-05	6.67E-01

Notes:

(a) Emission Factors from AP-42 Chapter 1.4, "Natural Gas Combustion".

(b) IDAPA 58.01.01.585 and 586

\* FNA - Factor Not Available

# Criteria Air Pollutant Emissions Permeate Fluid-Bed (P104)

Combustion Source Characteristics		Stack Data <sup>b</sup>	
Manufacturer	C/E/Rogers	Stack ID	P104
Model	Fluid-Bed Baghouse	Stack Height (ft)	116.75
		Stack Diameter (ft)	4.167
		Exit Gas Temperature (°F)	130
		Wet Actual Flow Rate (acfm)	29,384
		Stack Velocity (m/s)	10.94

Criteria Pollutants						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM <sub>10</sub>	Process	See Note a		1.97	8.6	0.25

Non-Criteria Pollutants with Significant Threshold						
Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM	Process	See PM <sub>10</sub>		1.97	8.6	0.25

**Notes:**

(a) Emission factor for PM/PM<sub>10</sub> estimated from C/E/Rogers original performance guarantee. C/E/Rogers updated their performance guarantee for the Fluid-bed baghouse to discharge 1.1 lb/hr. This change is not reflected in this calculation sheet, the emissions inventory, or in modeling since we were able to demonstrate compliance using the higher limit (it is shown on the PFD, Appendix 6).

(b) Stack parameters were determined as follows: discharge temperature = actual (based on design by C/E/Rogers), discharge flow rate = actual (based on design by C/E/Rogers), stack height and diameter = actual (details provided on construction drawings).

# Criteria Air Pollutant Emissions Permeate Powder Receiving (P105)

## Combustion Source Characteristics

Manufacturer	C/E/Rogers
Model	Permeate Powder Receiving Baghouse

## Stack Data

Stack ID	P105
Stack Height (ft)	43.083
Stack Diameter (ft)	Horizontal <sup>b</sup>
Exit Gas Temperature (°F)	Ambient <sup>b</sup>
Wet Actual Flow Rate (acfm)	NA
Stack Velocity (m/s)	Horizontal <sup>b</sup>
Discharge Orientation	Horizontal

## Criteria Pollutants

Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM <sub>10</sub>	Process	See Note a		0.047	0.2	0.01

## Non-Criteria Pollutants with Significant Threshold

Pollutant	Pollutant Source	Emission Factor <sup>a</sup>	Emission Factor Unit	Potential Emissions (lb/hr)	Potential Emissions (TPY)	Potential Emissions (g/s)
PM	Process	See PM <sub>10</sub>		0.047	0.2	0.01

### Notes:

- (a) Emission factor for PM/PM<sub>10</sub> estimated from C/E/Rogers original performance guarantee. C/E/Rogers updated their performance guarantee for the Powder Receiver baghouse to discharge 0.0441 lb/hr. This change is not reflected in this calculation sheet, the emissions inventory, or in modeling since we were able to demonstrate compliance using the higher limit (it is shown on the PFD, Appendix
- (b) The discharge is horizontal; therefore, the modeling velocity = 0.001 m/s and diameter = 0.001 m. The ambient temperature discharge default value of 0 K was used (conservative assumption).